

**HARGIS + ASSOCIATES, INC.**

HYDROGEOLOGY • ENGINEERING

Mission City Corporate Center  
2365 Northside Drive, Suite C-100  
San Diego, CA 92108  
Phone: 619.521.0165  
Fax: 619.521.8580

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## Technical Memorandum

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### VIA FEDERAL EXPRESS & EMAIL

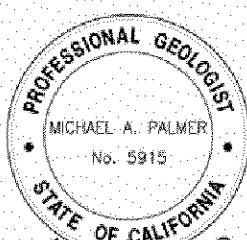
Date: February 12, 2007

Project No: 857.50C

To: Mr. Jeffrey Dhont  
U.S. ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
Mail Code H-7-1  
San Francisco, CA 94105

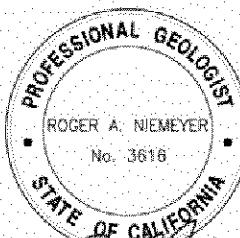
cc: Mr. Joe Kelly, Montrose  
Mr. Paul Sundberg, Montrose  
Karl Lytz, Esq., Latham & Watkins  
Kelly Richardson, Esq., Latham & Watkins  
Ms. Natasha Raykhman, CH2M HILL  
Mr. Mike Basial, CH2M Hill  
Mr. Safouh Sayed, DTSC  
Mr. Frank Gonzales, DTSC  
Mr. John Dudley, URS  
Luke Mette, Esq., Stauffer Management Company LLC  
Mr. Lee Erickson, Stauffer Management Company LLC  
Paul Galvani, Esq., Ropes & Gray  
Mr. Ron Giraudi, TRC Solutions, Inc.

From:



*Michael A. Palmer*

Michael A. Palmer, PG 5915, CHG 146



*Roger A. Niemeyer*

Roger A. Niemeyer, PG 3616, CHG 43

Re: Interim Data Deliverable, Pilot Extraction Test at Extraction Well G-EW-1, Montrose Site, Torrance, California

As requested, this Technical Memorandum transmits data collected during the constant rate extraction test performed at extraction well G-EW-1, which was installed in the Gage aquifer on

Technical Memorandum Re Interim Data Deliverable, Extraction Well G-EW-1  
February 12, 2007  
Page 2

property owned by Waste Management, approximately 1/4 mile south of the Montrose Chemical Corporation of California (Montrose) property. This interim data deliverable is being provided to allow the U.S Environmental Protection Agency (EPA) to review and evaluate the test results in advance of the Pilot Testing Completion Report, which will be prepared and submitted after the conclusion of the pilot testing program.

The pilot extraction test was conducted in general accordance with the Pilot Extraction and Aquifer Response Test Workplan Revision 4.0 (Workplan) dated August 12, 2005, prepared by Hargis + Associates, Inc. (H+A) on behalf of Montrose (H+A, 2005). The Workplan was approved by EPA on August 18, 2005 (EPA, 2005).

The CD attached to this Technical Memorandum contains the extraction system operational data, as well as the manual and transducer water level data collected during the constant rate pilot extraction test conducted at extraction well G-EW-1 (Attachment A).

### **Well Construction**

Extraction well G-EW-1 was constructed between August 4 and August 15, 2005. The well was completed in the Gage aquifer with the screen interval set at 144 to 197 feet below land surface. Well construction details are provided in Figure 1. The well was subsequently developed between August 15 and August 18, 2005, using dual swabbing and air-lifting techniques.

### **Step Extraction Test**

The extraction step test was conducted on August 30 and 31, 2006, to evaluate the well specific capacity and to allow selection of an appropriate extraction rate for the constant rate test. The step test was conducted at increasing extraction rates of approximately 100, 150, and 180 gallons per minute (gpm). Based on the results of the step test, a target extraction rate of approximately 180 gpm was selected for the constant rate test.

### **Constant Rate Extraction Test**

The constant rate extraction test began on September 11, 2006 at 11:20 AM and was terminated five days later on September 16, 2006, at 10:37 AM. Data regarding extraction well operations, such as extraction rates and total volume extracted, are provided in the Excel spreadsheet located in Attachment A in the folder labeled "Operations Data". During the test, the extraction rate averaged approximately 186 gpm.

By the end of the extraction test the water level in the extraction well had fallen to 111.47 feet below the measuring point, or a total drawdown up of approximately 55.80 feet below the original static water level of 55.67 feet below the measuring point (Figure 2).

### **Water Level Monitoring Results**

The water level response in the surrounding area due to extraction at extraction well G-EW-1 was monitored using a combination of manual water level measurements and pressure transducers (Table 1; Figure 3). Manual water level data are provided on the attached CD in the folder labeled "Manual Water Level Data" and pressure transducer data are provided on the attached CD in the

Technical Memorandum Re Interim Data Deliverable, Extraction Well G-EW-1  
February 12, 2007  
Page 3

folder labeled "Transducer Data" (Attachment A). Pursuant to an EPA request, all aquifer response data is provided as drawdown data rather than depth to water.

The Workplan indicates that three tiers of wells would be monitored as needed based on response to the extraction testing. However, during this test, all wells in all three tiers were monitored throughout the test regardless of the degree of response in higher order tiers. Manual water levels were measured in all program wells prior to the start of the extraction test and at the conclusion of the recovery period to track long term water level trends. The following discussion is based on the water level drawdown measured at the end of the extraction period.

### Aquifer Response

Water level response was seen in the Bellflower sand (BFS), the Gage aquifer (Gage), and the Lynwood aquifer. Figures showing the estimated drawdown at the end of the extraction phase of the test in the BFS and the Gage are provided (Figures 4 and 5).

The maximum water level drawdown detected in the tested unit, the Gage, was 10.17 feet at monitor well G-6 located approximately 81 feet from the extraction well. Drawdown exceeding 0.5 feet extended radially outward from the extraction well approximately 3,000 feet (Figure 4).

The drawdown in the BFS due to extraction from the Gage was relatively small due to the presence of the fine-grained lower Bellflower aquitard, which can restrict the amount of leakance that can occur between these aquifer zones. A maximum drawdown of approximately 0.39 feet was observed in the BFS at monitor well BF-5, located approximately 775 feet northeast of the extraction well, and monitor well BF-2, located approximately 860 feet northwest of the extraction well (Figure 5). Drawdown of approximately 0.3 feet was observed in the BFS over an area extending approximately 1,700 feet northwest and 1,000 feet southeast of the test well (Figure 5).

A minor response to extraction in the Gage was detected in the two Lynwood aquifer wells monitored by transducers. It was not possible to quantify the drawdown due to the test in the Lynwood aquifer, but it was determined that the response in the Lynwood aquifer was no greater than approximately 0.10 feet (Attachment A).

A more detailed explanation of the data analysis process is provided in Attachment B.

### Attachments

Table 1. Extraction Well G-EW-1 Extraction Test, Water Level Observation Wells  
Table 2. Extraction Well G-EW-1 Extraction Test, Drawdown Trend Data

Figure 1. As-Built Construction Diagram, Extraction Well G-EW-1  
Figure 2. Water Level Drawdown in Extraction Well G-EW-1  
Figure 3. Monitor Well Location, G-EW-1 Extraction Test  
Figure 4. Water Level Drawdown, Gage Aquifer, Pilot Extraction Test, G-EW-1  
Figure 5. Water Level Drawdown, Bellflower Sand, Pilot Extraction Test, G-EW-1  
Figure 6. G-EW-1 Extraction Test Barometric Transducer Data  
Figure 7. Comparison of Background Well Transducer Response, G-EW-1 Extraction Test

Attachment A. Extraction System Operational Data and Manual and Transducer Water Level Data CD  
Attachment B. Data Analysis and Presentation  
Attachment C. Corrected Transducer Data and Drawdown Trend Graphs



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Technical Memorandum Re Interim Data Deliverable, Extraction Well G-EW-1  
February 12, 2007  
Page 4

## References

Hargis + Associates, Inc., 2005. Pilot Extraction and Aquifer Response Test Workplan, Montrose Site, Torrance, California, DSGWRD 26 – 036, Revision 4.0. August 12, 2005.

U.S. Environmental Protection Agency, 2005. Letter to J. Kelly, Montrose Chemical Corporation of California, Re EPA Approval of Revised Workplan for the Pilot Extraction and Aquifer Response Test Work Plan (DSGWRD 26 – 036) Revision 4.0; Dual Site Groundwater Operable Unit Remedial Design; Montrose Chemical Superfund Site, Los Angeles, CA, dated August 18, 2005.

**TABLE 1**  
**Extraction Well G-EW-1 Extraction Test**  
**Water Level Observation Wells**

Well ID	Distance from G-EW-1 (ft)	Total Well Depth (ft bgs)	HSU (Montrose Designation)	HSU (Del Amo Designation)	Water Level Measured Manually	Water Level Measured with Transducer	Background Water Level Well
BL-10A	2,912	80	UBA	MBFB	X	X	X
MW-25	1,991	75	UBA	WT/UBF	X	X	X
BF-02	860	128	BFS	MBFC	X		
BF-05	775	135	BFS	MBFC	X		
BF-06	391	132	BFS	MBFC	X		
BF-07	66	119	BFS	MBFC	X	X	
BF-09	1,011	129	BFS	MBFC	X		
BF-15	1,164	114	BFS	MBFC	X		
BF-20	1,558	130	BFS	MBFC	X		
BF-33	4,522	101	BFS	MBFC	X	X	X
BF-36	6,299	128	BFS	MBFC	X	X	X
BL-10B	2,912	119	BFS	MBFC	X	X	X
LBF-OW-2	32	136	BFS	MBFB	X	X	
SWL0033	1,213	143	BFS	MBFC	X		
SWL0058	1,172	129	BFS	MBFC	X		
BL-10C	2,912	155	Gage	Gage	X	X	
G-01	1,290	165	Gage	Gage	X	X	
G-02	475	180	Gage	Gage	X	X	
G-03	891	170	Gage	Gage	X		
G-04	783	195	Gage	Gage	X	X	
G-05	377	194	Gage	Gage	X		
G-06	81	192	Gage	Gage	X	X	
G-08	1,169	181	Gage	Gage	X	X	
G-11	2,305	218	Gage	Gage	X		
G-12	1,622	198	Gage	Gage	X		
G-13	1,458	197	Gage	Gage	X	X	
G-14	1,429	196	Gage	Gage	X		
G-15	948	184	Gage	Gage	X	X	
G-16	1,051	187	Gage	Gage	X		
G-17	1,443	213	Gage	Gage	X	X	
G-19A	2,308	204	Gage	Gage	X	X	
G-20	1,742	176	Gage	Gage	X		
G-21	1,394	171	Gage	Gage	X		
G-23	3,367	180	Gage	Gage	X		
G-24	1,924	182	Gage	Gage	X		
G-31	7,835	175	Gage	Gage	X	X	X
G-EW-1	0	197	Gage	Gage	X	X	
G-OW-1	2,793	185	Gage	Gage	X	X	
LG-01	430	211	Gage	Gage	X	X	
LG-02	828	207	Gage	Gage	X		
SWL0022	2,721	197	Gage	Gage	X		

**TABLE 1**  
**Extraction Well G-EW-1 Extraction Test**  
**Water Level Observation Wells**

Well ID	Distance from G-EW-1 (ft)	Total Well Depth (ft bgs)	HSU (Montrose Designation)	HSU (Del Amo Designation)	Water Level Measured Manually	Water Level Measured with Transducer	Background Water Level Well
SWL0026	3,253	178	Gage	Gage	X		
SWL0034	1,208	178	Gage	Gage	X	X	
SWL0036	2,419	197	Gage	Gage	X		
LW-01	842	251	LW	LW	X		
LW-02	444	253	LW	LW	X		
LW-03	1,434	261	LW	LW	X	X	
LW-04	45	246	LW	LW	X	X	
LW-06	935	256	LW	LW	X		
LW-07	886	251	LW	LW	X		

ft = feet

bgs = below ground surface

HSU = Hydrostratigraphic Unit

BF-# = Bellflower sand monitor well

BL-# = Boeing monitor well

G-# = Gage aquifer monitor well

G-EW-# = Gage aquifer extraction well

G-OW-# = Gage aquifer observation well

LBF-# = Lower Bellflower aquitard monitor well

LG-# = Lower Gage monitor well

LW-# = Lynwood aquifer monitor well

MW-# = UBA monitor well

SWL# = Del Amo monitor well

BFS = Bellflower sand

Gage = Gage aquifer

LW = Lynwood aquifer

MBFB = Middle Bellflower B sand

MBFC = Middle Bellflower C sand

UBA = Upper Bellflower aquitard

UBF = Upper Bellflower

WT = Water Table

**TABLE 2**  
**Extraction Well G-EW-1 Extraction Test**  
**Drawdown Trend Data**

Gage Aquifer													
G-01		G-02		G-04		G-06		G-08		G-13		G-15	
Elapsed Time (mins)	Drawdown (ft)												
25	0.00	7	0.00	10	0.00	0	0.00	10	0.00	0	0.00	0	0.00
385	1.31	367	3.48	370	2.41	360	9.10	370	1.64	360	1.10	360	1.73
745	1.69	727	3.99	730	2.93	720	9.63	730	2.13	720	1.66	720	2.14
1105	1.87	1087	4.20	1090	3.16	1080	9.86	1090	2.35	1080	1.87	1080	2.35
1465	1.95	1447	4.28	1450	3.27	1440	9.94	1450	2.46	1440	2.00	1440	2.43
1825	2.00	1807	4.33	1810	3.34	1800	9.95	1810	2.52	1800	2.04	1800	2.45
2185	2.02	2167	4.34	2170	3.37	2160	9.93	2170	2.54	2160	2.07	2160	2.46
2545	2.04	2527	4.35	2530	3.38	2520	9.91	2530	2.56	2520	2.10	2520	2.47
2905	2.06	2887	4.40	2890	3.43	2880	10.07	2890	2.59	2880	2.12	2880	2.49
3265	2.10	3247	4.42	3250	3.48	3240	10.14	3250	2.61	3240	2.18	3240	2.53
3625	2.11	3607	4.45	3610	3.49	3600	10.11	3610	2.62	3600	2.19	3600	2.53
3985	2.11	3967	4.45	3970	3.49	3960	10.11	3970	2.64	3960	2.21	3960	2.54
4345	2.11	4327	4.47	4330	3.50	4320	10.11	4330	2.66	4320	2.23	4320	2.54
4705	2.11	4687	4.47	4690	3.51	4680	10.11	4690	2.67	4680	2.23	4680	2.55
5065	2.11	5047	4.47	5050	3.51	5040	10.11	5050	2.69	5040	2.24	5040	2.55
5425	2.11	5407	4.47	5410	3.51	5400	10.17	5410	2.71	5400	2.25	5400	2.56
5785	2.13	5767	4.48	5770	3.51	5760	10.17	5770	2.73	5760	2.25	5760	2.59
6145	2.14	6127	4.50	6130	3.52	6120	10.20	6130	2.74	6120	2.26	6120	2.59
6505	2.14	6487	4.50	6490	3.52	6480	10.15	6490	2.74	6480	2.27	6480	2.59
6865	2.14	6847	4.50	6850	3.52	6840	10.12	6850	2.74	6840	2.27	6840	2.60
7165	2.14	7147	4.51	7150	3.52	7140	10.19	7150	2.74	7140	2.27	7140	2.60

mins = minutes

ft = feet

BL-# = Boeing monitor well

BF-# = Bellflower sand monitor well

LBF-# = Lower Bellflower aquitard monitor well

SWL# = Del Amo monitor well

LG-# = Lower Gage monitor well

G-# = Gage aquifer monitor well

G-OW-# = Gage aquifer observation well

**TABLE 2**  
**Extraction Well G-EW-1 Extraction Test**  
**Drawdown Trend Data**

Gage Aquifer												Lower Gage	
G-17		G-19A		G-OW-1		SWL0034		BL-10C		LG-01			
Elapsed Time (mins)	Drawdown (ft)												
0	0.00	5	0.00	0	0.00	5	0.00	5	0.00	0	0.00		
360	1.04	365	0.30	360	0.22	365	1.44	365	0.19	360	3.54		
720	1.50	725	0.64	720	0.40	725	2.00	725	0.36	720	4.11		
1080	1.75	1085	0.80	1080	0.47	1085	2.25	1085	0.45	1080	4.34		
1440	1.92	1445	0.93	1440	0.52	1445	2.37	1445	0.50	1440	4.45		
1800	1.98	1805	0.96	1800	0.55	1805	2.45	1805	0.54	1800	4.51		
2160	2.01	2165	1.00	2160	0.56	2165	2.50	2165	0.56	2160	4.52		
2520	2.03	2525	1.02	2520	0.57	2525	2.51	2525	0.57	2520	4.53		
2880	2.07	2885	1.05	2880	0.58	2885	2.56	2885	0.59	2880	4.58		
3240	2.10	3245	1.05	3240	0.58	3245	2.60	3245	0.60	3240	4.64		
3600	2.13	3605	1.05	3600	0.59	3605	2.60	3605	0.60	3600	4.64		
3960	2.14	3965	1.08	3960	0.59	3965	2.61	3965	0.60	3960	4.65		
4320	2.15	4325	1.08	4320	0.59	4325	2.61	4325	0.60	4320	4.65		
4680	2.15	4685	1.08	4680	0.59	4685	2.61	4685	0.60	4680	4.65		
5040	2.15	5045	1.08	5040	0.59	5045	2.61	5045	0.60	5040	4.65		
5400	2.15	5405	1.08	5400	0.59	5405	2.62	5405	0.60	5400	4.65		
5760	2.15	5765	1.09	5760	0.61	5765	2.63	5765	0.62	5760	4.68		
6120	2.15	6125	1.09	6120	0.61	6125	2.64	6125	0.63	6120	4.68		
6480	2.15	6485	1.10	6480	0.61	6485	2.64	6485	0.62	6480	4.68		
6840	2.15	6845	1.10	6840	0.61	6845	2.64	6845	0.63	6840	4.68		
7140	2.15	7145	1.10	7140	0.61	7145	2.65	7190	0.63	7140	4.68		

mins = minutes

ft = feet

BL-# = Boeing monitor well

BF-# = Bellflower sand monitor well

LBF-# = Lower Bellflower aquitard monitor well

SWL# = Del Amo monitor well

LG-# = Lower Gage monitor well

G-# = Gage aquifer monitor well

G-OW-# = Gage aquifer observation well

**TABLE 2**  
**Extraction Well G-EW-1 Extraction Test**  
**Drawdown Trend Data**

Bellflower Sand												Lower Bellflower	
BF-05		BF-07		BF-09		BF-15		BF-20		BL-10B		LBF-OW-2	
Elapsed Time (mins)	Drawdown (ft)												
0	0.00	0	0.00	10	0	10	0.00	10	0.00	0	0.00	0	0.00
360	0.06	360	0.04	370	0.06	370	0.00	370	0.10	360	0.01	360	1.06
720	0.09	720	0.09	730	0.13	730	0.05	730	0.18	720	0.07	720	1.52
1080	0.12	1080	0.13	1090	0.18	1090	0.08	1090	0.23	1080	0.10	1080	1.70
1440	0.16	1440	0.16	1450	0.22	1450	0.11	1450	0.26	1440	0.11	1440	1.81
1800	0.19	1800	0.18	1810	0.24	1810	0.12	1810	0.28	1800	0.13	1800	1.89
2160	0.23	2160	0.20	2170	0.26	2170	0.14	2170	0.30	2160	0.14	2160	1.94
2520	0.25	2520	0.22	2530	0.27	2530	0.15	2530	0.32	2520	0.15	2520	1.97
2880	0.28	2880	0.23	2890	0.29	2890	0.16	2890	0.33	2880	0.16	2880	2.00
3240	0.30	3240	0.25	3250	0.3	3250	0.17	3250	0.34	3240	0.17	3240	2.05
3600	0.32	3600	0.26	3610	0.31	3610	0.18	3610	0.35	3600	0.19	3600	2.08
3960	0.33	3960	0.28	3970	0.32	3970	0.19	3970	0.36	3960	0.20	3960	2.10
4320	0.34	4320	0.29	4330	0.33	4330	0.21	4330	0.37	4320	0.21	4320	2.10
4680	0.35	4680	0.30	4690	0.34	4690	0.22	4690	0.38	4680	0.22	4680	2.10
5040	0.36	5040	0.31	5050	0.35	5050	0.22	5050	0.39	5040	0.23	5040	2.11
5400	0.36	5400	0.32	5410	0.35	5410	0.23	5410	0.40	5400	0.23	5400	2.10
5760	0.37	5760	0.33	5770	0.36	5770	0.25	5770	0.41	5760	0.23	5760	2.10
6120	0.37	6120	0.33	6130	0.36	6130	0.25	6130	0.41	6120	0.23	6120	2.11
6480	0.37	6480	0.34	6490	0.37	6490	0.26	6490	0.42	6480	0.23	6480	2.11
6840	0.38	6840	0.34	6850	0.37	6850	0.26	6850	0.42	6840	0.23	6840	2.11
7155	0.38	7155	0.34	7150	0.37	7150	0.28	7150	0.42	7155	0.23	7140	2.12

mins = minutes

ft = feet

BL-# = Boeing monitor well

BF-# = Bellflower sand monitor well

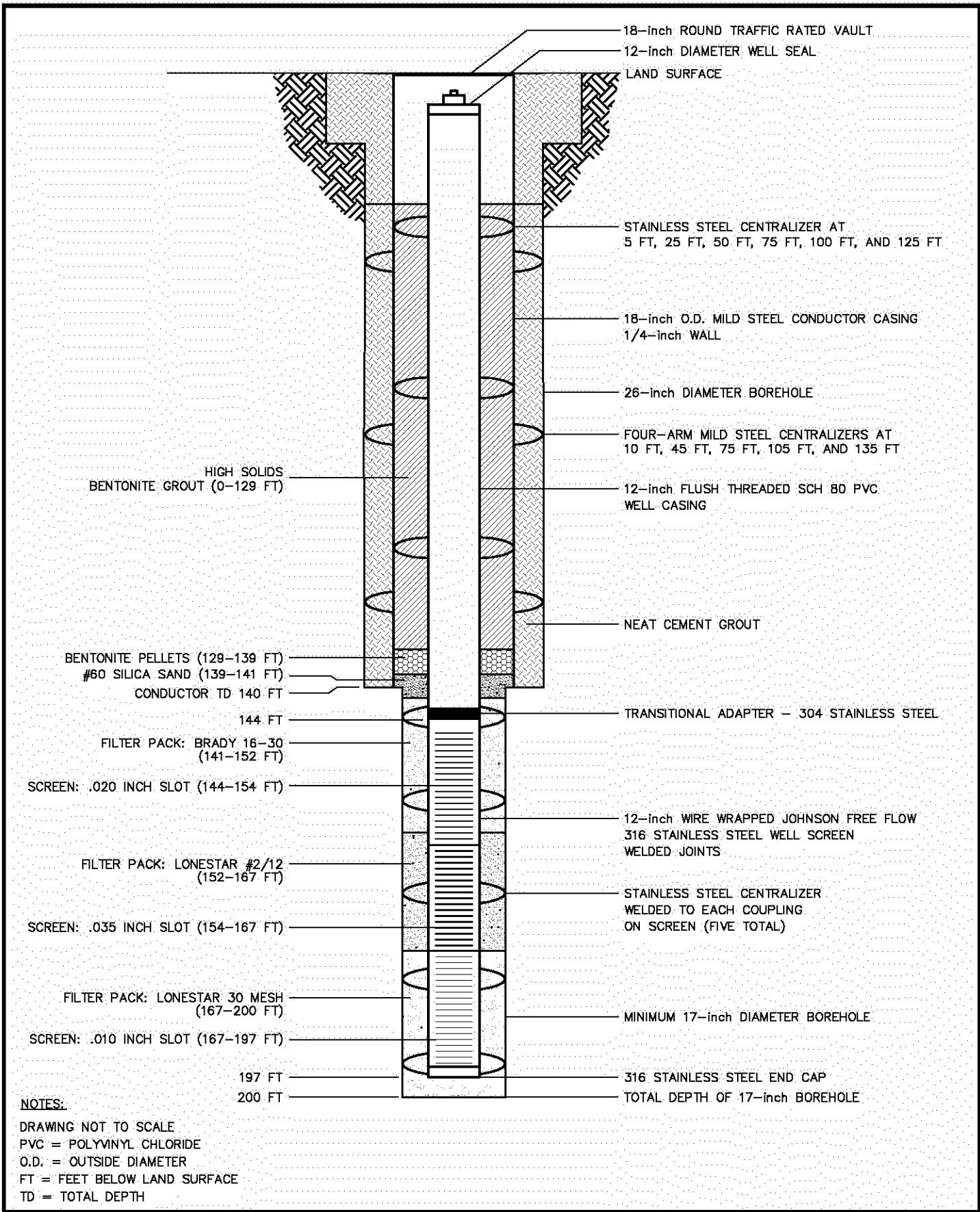
LBF-# = Lower Bellflower aquitard monitor well

SWL# = Del Amo monitor well

LG-# = Lower Gage monitor well

G-# = Gage aquifer monitor well

G-OW-# = Gage aquifer observation well

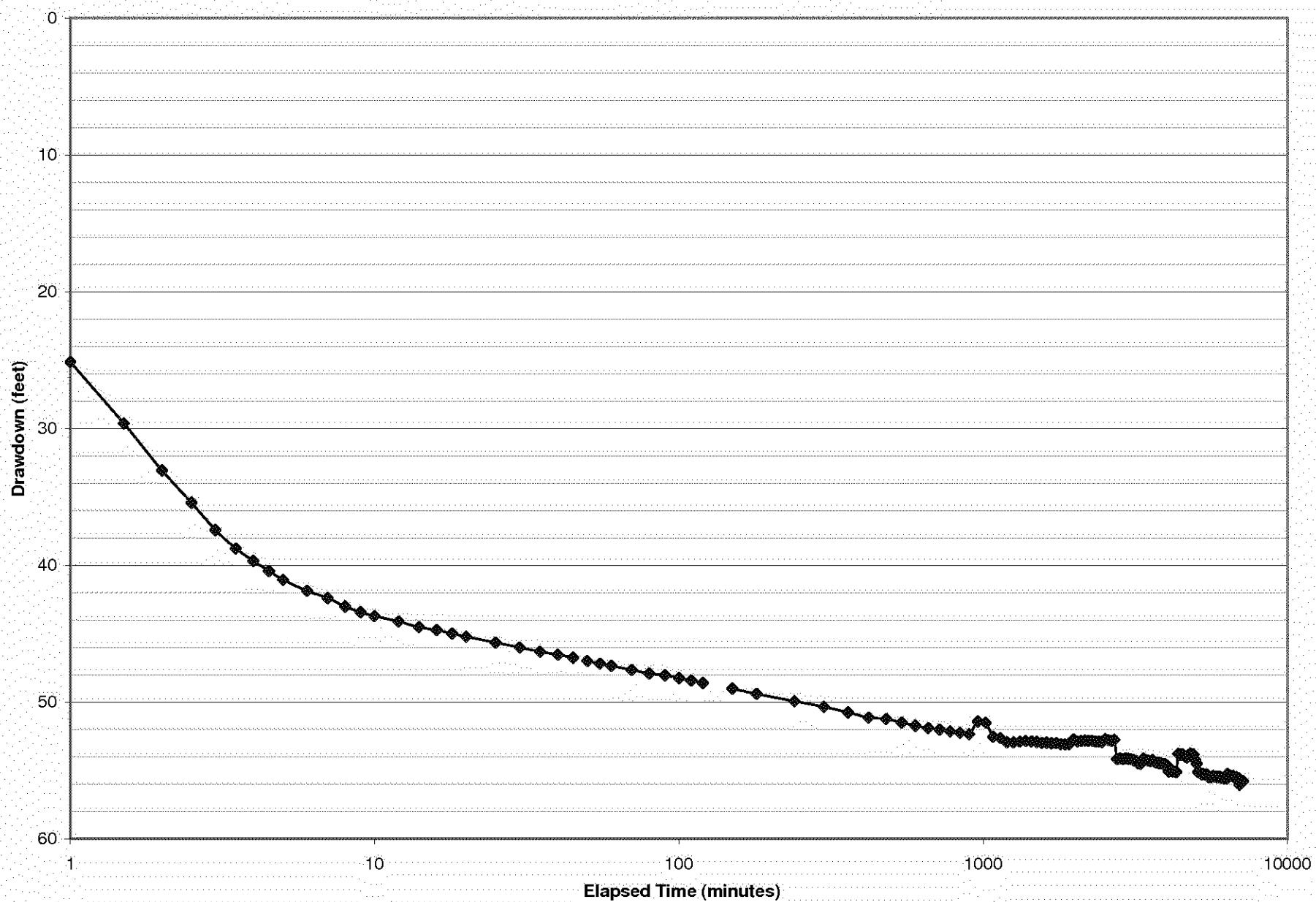


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1/07 | RPT NO. 857.39 | 710-0537 | B

**FIGURE 1.**  
**AS-BUILT CONSTRUCTION DIAGRAM**  
**EXTRACTION WELL G-EW-1**

Figure 2  
Water Level Drawdown in Extraction Well G-EW-1

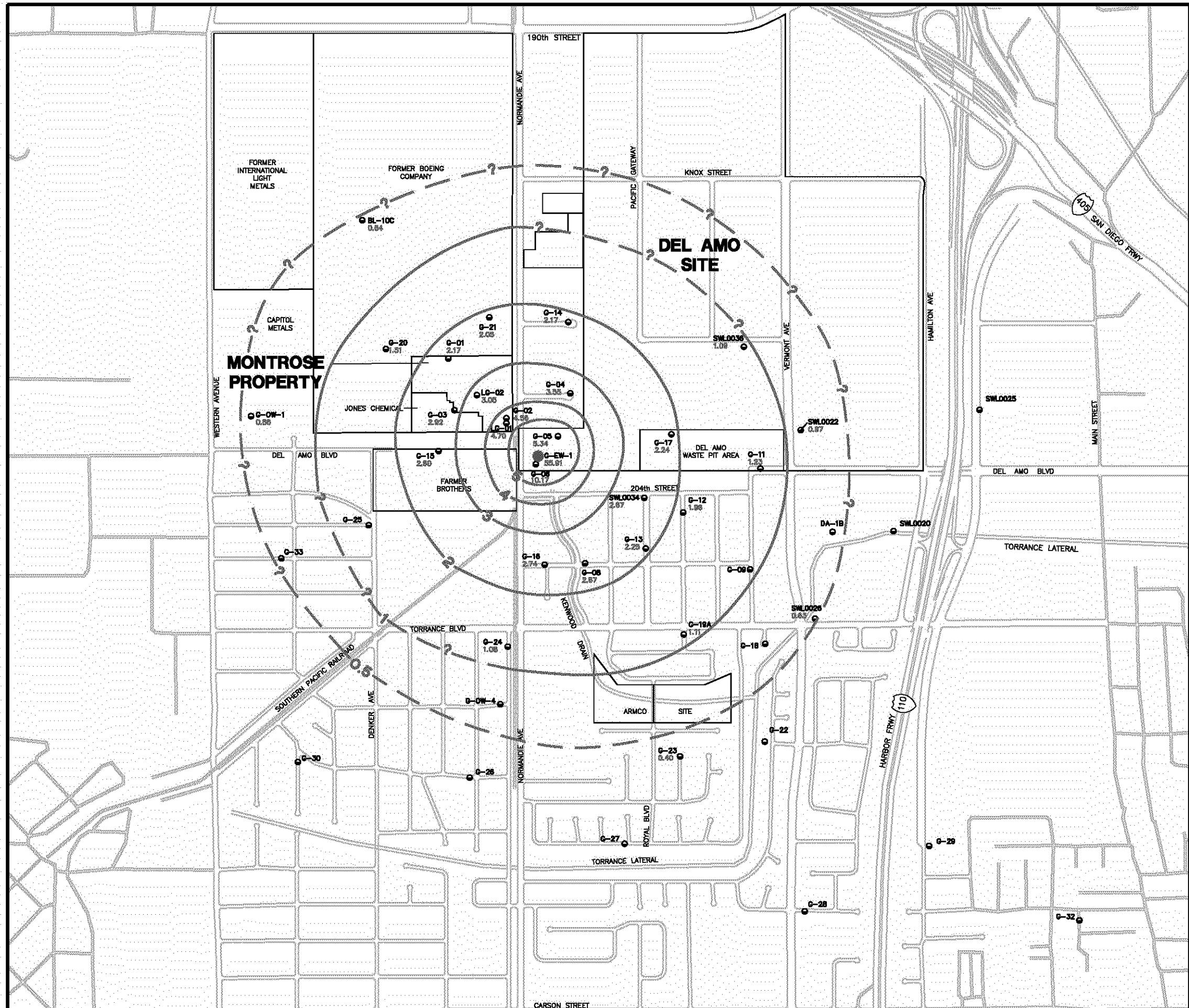




## EXPLANATION

G-04  
 ●  
 GAGE AQUIFER MONITOR WELL  
 LG-02  
 ●  
 LOWER GAGE AQUIFER MONITOR WELL  
 G-EW-1  
 ●  
 GAGE AQUIFER EXTRACTION WELL  
 55.87  
 SAN DIEGO FRWY  
 405  
 WATER LEVEL DRAWDOWN ON SEPTEMBER 16, 2006  
 PRIOR TO COMPLETION OF 5 DAY EXTRACTION  
 TEST AS DETERMINED BY MANUAL WATER LEVEL  
 MEASUREMENT. EXTRACTION RATE APPROXIMATELY  
 186 GALLONS PER MINUTE.

CONTOUR LINE OF EQUAL WATER LEVEL DRAWDOWN  
IN FEET BELOW STATIC WATER LEVEL; DASHED WHERE APPROXIMATE, QUERIED WHERE INFERRED



MONTROSE CHEMICAL CORPORATION  
TORRANCE, CALIFORNIA

### WATER LEVEL DRAWDOWN GAGE AQUIFER PILOT EXTRACTION TEST, G-EW-1

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Hydrogeology/Engineering

1/07

PREP BY RDC REV BY MAP RPT NO. 857.39 410-6073 C

FIGURE 4

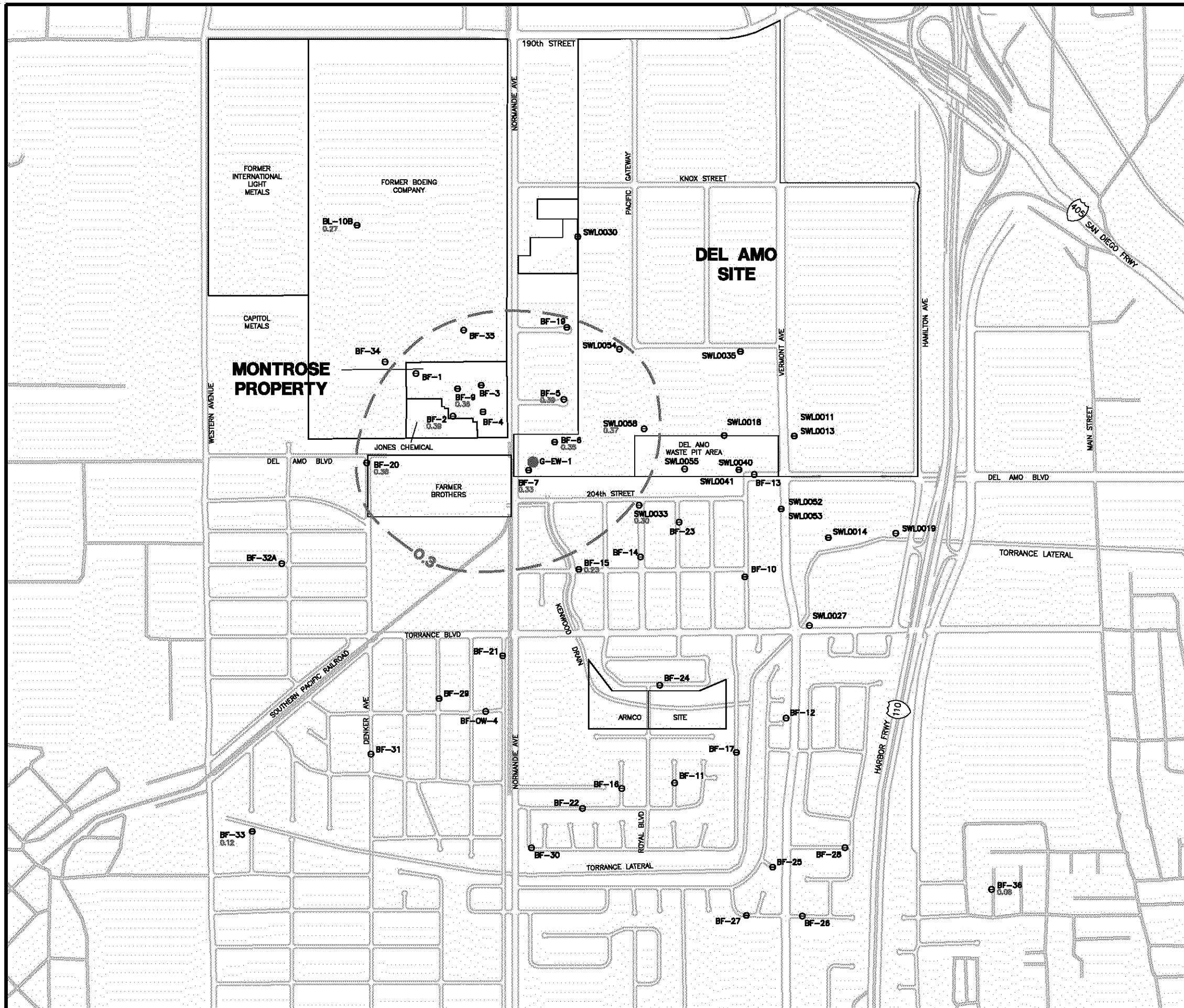


Figure 6  
G-EW-1 Extraction Test Barometric Transducer Data



**FIGURE 7**  
Comparison of Background Well Transducer Response  
G-EW-1 Extraction Test

